REMARKS

Claims 1-18 are pending in this application. By this Amendment, claims 19-21 are canceled because these claims were drawn to non-elected claims. However, Applicants reserve the right to file a divisional application at a later date if they so desire.

I.   Information Disclosure Statement

An Information Disclosure Statement with Form PTO-1449 was filed on October 18, 2001. Although the Office Action included an initialed copy of that Form PTO-1449, one of the references, the non-patent reference to X. Li et al., was not initialed to acknowledge the fact that the Examiner has considered the cited information. The Examiner is requested to fully initial and return to the undersigned a copy of the subject Forms PTO-1449. For the convenience of the Examiner, a copy of that form is attached.

II.   The Claims Define Patentable Subject Matter

The Office Action rejects claims 1-18 under 35 U.S.C. §102(b) as being anticipated by Husseiny, U.S. Patent No. 5,210,704. The rejection is respectfully traversed.

Applicants' claimed invention relates to monitoring the health of a system by constructing a condition signature from a plurality of condition indicators including a plurality of vibration measurements and performance parameters, predicting a normal signature, which is the condition signature of a healthy system, and comparing the condition signature with the normal signature.

Husseiny, on the other hand, discloses a wearout monitor that performs failure analysis to provide an early warning of component failure in two stages. Husseiny determines whether the signals obtained from the instrumentation and sensors are indicative of abnormal conditions. Then, if abnormal conditions are detected, Husseiny goes on to analyze the possible impending failure in more detail. In particular, Husseiny discloses in Fig. 5 a failure scenario template 620 that is used to predict global or local failures; in Fig. 6,

management terminals 760 are invoked; in Fig. 10, diagnostic logic 824 and prognostic logic 823 blocks are used to recognize the likely failure scenario; and in Fig. 14A, prognostic 16 and diagnostic 17 functions are invoked. Further, Husseiny discloses that once abnormal conditions are detected, models are developed for the whole system to generate global indices (GIFI), each of which corresponds to a defect or failure mode (col. 17, lines 43- 46).

The significant feature in Husseiny is the models, which are used at both stages, e.g., the abnormal conditions make use of physical models or knowledge-based models. Hence, Husseiny's wearout monitor is based on historical data, derived fault trees and a complete understanding of all expected failure modes/causes and effects. This means that the wearout monitor is at best plant specific, and nominally it is component specific. That is, a great deal of engineering knowledge in the form of component design, operating characteristics and expected failure mechanisms must be available to establish where signals need to be monitored, and which characteristics of these signals must be analyzed. For example, if the wearout monitor is configured to predict component failure in a helicopter gearbox, Husseiny's system will not necessarily be able to predict component failure in another system without extensive re-configuration.

Accordingly, Husseiny fails to disclose or suggest predicting a normal signature from a model defining one or more inter-dependencies between the condition indicators, the normal signature corresponding to a condition signature for a healthy system, as recited in claim 1 and similarly recited in claim 8.

The Office Action alleges, on page 4, that Husseiny discloses the step of predicting a normal signature which corresponds to the condition signature for a healthy system and cites (i) col. 25, lines 44-52, (ii) col. 26, lines 25-30, and (iii) Fig. 4 in Husseiny. However, Applicants respectfully submit that neither (i) nor (ii) discloses the derivation of predicted system measurements because they cannot relate to the prediction of a normal signature. In

particular, (i) and (ii) merely describe the model parameters as providing an indication of the dynamic behavior of the component (col. 25, lines 50-52), and not a predicted system measurement. In regard to (iii), Husseiny discloses (in Fig. 4) having blocks 600 and 607 for respectively computing and predicting state variables k(+). However, these variables are not predicted system measurements. That is, Husseiny discloses that x is the state variable vector and z is the vector representing a sequence of measurements (col. 11, line 6 - col. 12, line 6). Accordingly, it follows that the state variables k(+) cannot be considered measurements.

Accordingly, Husseiny fails to disclose or suggest predicting a normal signature which corresponds to the condition signature for a healthy system, as recited in claims 1 and 8.

Further, Husseiny also fails to disclose or suggest comparing the condition signature with the normal signature, as recited in claims 1 and 8.

Because Husseiny does not disclose or suggest predicting normal signatures, as discussed above. Husseiny, as such, cannot disclose comparing the normal signature with the condition signature.

Nonetheless, the Office Action alleges, on page 4, that Husseiny discloses comparing the condition signature with the normal signature and cites (iv) col. 25, lines 9-17, (v) col. 26 lines, 31-34, and (vi) Fig. 14A in Husseiny. However, Applicants respectfully submit that (iv) and (v) fail to disclose or mention any comparison step. In regard to (vi), Husseiny merely discloses that step 10 in Fig. 14A is between INDEX and INDEX' vectors. The INDEX vector contains incipient failure index (IFI), which is sensitive to the malfunctions (col. 18, lines 8-9), and the INDEX' vector is a similar quantity containing a new index $(IFI)_{new}$ (col. 18, lines 25-27). Thus, there is nothing to suggest that these vectors respectively contain actual and predicted system measurements.

Accordingly, Husseiny fails to disclose or suggest comparing the condition signature that the normal signature, as recited in claims 1 and 8.

Claims 17 and 18, which are directed to the system for monitoring the health of a system, do not disclose or suggest the processor means for predicting a normal signature and comparator means for comparing the condition signature with the normal signature.

Because Husseiny does not disclose each and every feature of the claimed invention, it cannot provide the basis for a rejection under 35 U.S.C. §102. Thus, it is respectfully requested that the rejection be withdrawn.

For at least these reasons, Applicants respectfully submit that Husseiny fails to disclose the features recited in independent claims 1, 8, 17 and 18. Claims 2-7 and 9-16, which depend from the independent claims, are likewise distinguished over the applied art for at least the reasons discussed above, as well as for the additional features they recite. Reconsideration and withdrawal of the rejection under 35 U.S.C. §102 are respectfully requested.

III. Conclusion

In view of the foregoing amendments and remarks, it is respectfully submitted that the application is in condition for allowance. Favorable reconsideration and prompt allowance of claims 1-18 are earnestly solicited.

Should the Examiner believe that anything further would be desirable in order to place this application in even better condition for allowance, the Examiner is invited to contact the undersigned at the telephone number set forth below.

Respectfully submitted,

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